Application No. 09/752,975

VERSION WITH MARKINGS TO SHOW CHANGES MADE

Paragraph beginning at line 11 of page 16 has been amended as follows:

The GW can also be generated in the direction normal to a [quadrupole] [(]harmonic-oscillator[)] axis or in the direction of a jerk, so that the particle-beam directed GW builds up or accumulates and generates a coherent GW as the beam particles progress through the target nuclei and thereby, emulates an extensive target mass. According to Douglas Torr and Ning Li (1993), Foundation of Physics Letters, Volume 6, Number 4, p.371 ". . . the lattice ions, . . . must execute coherent localized motion consistent with the phenomenon of superconductivity." Thus, a preferred embodiment is to have the target nuclei [constrained] <u>maintained</u> in a [cylindrical] superconductivity state. As the particle-beam bunch moves down the cylinder of target nuclei, it strikes one target nuclei after another, creating a GW and adding to the forward-moving or radially-directed GW's amplitude as it progresses in step with the bunch's particles in the preferred direction in space of FIG. 1A 22 thereby emulating an extensive target mass. The particle-beam bunches are modulated by a particle-emission and/or chopper-control computer to impart information by modulating the generated GW. In addition, since the GW can be slowed by virtue of passing through a medium such as a superconductor (Li and Torr op.cit. 1992) and, therefore, refracted by it, as in a lens, the GW can be focused and intensified. <u>The GW can also be generated in a direction normal to a dipole axis. According to Joseph Weber (1964), Gravitation and Relativity, W. A. Benjamin Inc., New York, p. 91, a summation of charge times acceleration gives rise to dipole radiation, which also can be accomplished gravitationally in a superconductor according to Li and Torr, op. Cit. 1992, pp. 5489ff and Torr and Li, op. Cit. 1993, pp. 371ff.</u>

Paragraph beginning at line 33 of pages 17 and 18 has been amended as follows:

The uncertainty is in the determination of the GW phases. Within, for example, a subpicosecond time resolution, all of the possible GW phases (or times that the GW crest hits the leading rows of collector elements) are initially swept through by the control computer to establish the phase that correlates best with the maximum amplitude of the received GW signal, that is, tuned to the GW signal. After this initialization the GW phase is tracked by, say, a Kalman filtering technique described on pp. 384-392 of Robert M.L. Baker, Jr. (1967) Astrodynamics, Applications and Advanced Topics, Academic Press, New York. The small voltages and currents produced by some of the alternative collector elements can be measured, for example, by a superconducting quantum interference device (SQUID) using Josephson junctions (described in U.S. Patent 4,403,189)and/or by quantum non-demolition (QND) techniques utilized in optics but applied to the problem of reducing quantum-noise limitations for high-frequency GW. The QND technique was first suggested by Vladimir Braginsky of the Moscow State University and published by A.M. Smith (1978) in "Noise Reduction in Optical Measurement Systems," IEE Proceedings, volume 125, Number 10, pp. 935-941. <u>Superconductors are also contemplated for use in connection with the collection elements as discussed in the previous application, Serial No. 09/616,683, filed July 14, 2000 so that the collection elements can be in a superconducting state.</u>

Please replace the paragraph beginning at page 23, line 13 with the following rewritten paragraph:

With KI3dot = 1, as in the case of the GW radiated by the centrifugal-force jerk of a spinning rod, from Eq.(1), p.90 of Joseph Weber (1964), "Gravitational Waves" in Gravitation and Relativity, Chapter 5, W.A. Benjamin, Inc., New York and Introducing Eq.(5), Eq.(2) becomes

$P = 1.76X10^{-52}\ (n\ 2r\ \Delta\ f_n/\Delta t)^2$ [watts]. (6)

The number of particles in a typical bunch is estimated to be approximately that of the Stanford Linear Collider (SLC) or 4x10" particles. It is estimated that 10% of the particles impact target nuclei and result in nuclear reaction (that is, a 10% harvest), so n = 4x1010. Inserting these numbers into Eq.(6) we have

$P = 1.76410^{-52}\ (4x10^{10}x2x0.01\ \Delta\ f_n/\Delta t)^2$ [watts] (7)

and, subject to further verification as to the mass defect and impulsive nuclear force, that is verification of the magnitude of the jerk, we take $\Delta\ f_n = 1x10^{-6}$ [N] and $\Delta t = 10^{-12}$ [s] resulting in

$P = 1.13x10^{-22}$ [watts].

The reference area is either the rim of a disk one centimeter thick and one centimeter in diameter or $3.14x10^{-4}$ [m^2] for a GW flux of $3.6x10^{-19}$ [watts/m^2] for a harmonic oscillation of the target elements or one square centimeter for a linear jerk of the target elements (there is a factor of 0.5 since the GW is bifurcated -- half moving in the direction of the jerk and half in the opposition direction). The former leads to a forward component of GW flux of $5.65x10^{-19}$ [watts/m^2]. A lens system composed of a media in which the GW is slowed (such as a superconducting media) could concentrate or focus the GW from, say, a one square centimeter, to (10 [micrometer])^2 for an increase in GW flux of 10^6 to $5.65x10^{-13}$ [watts/m^2]. Note that in the refraction medium the GW wavelength is significantly smaller than 10 [micrometers] at THz frequencies, so that GW diffraction, if present, is not very significant. All of the foregoing quadrupole equations are approximations to P. Due to the slowness of the GW, about one hundredth of light speed, the GW wavelength in the superconducting target is about $\lambda_{GW}\ 0.01c\Delta t = 3x10^6x10^{-12}=3x10^{-6}$[m], but still larger than the radius of the target nuclei, beam particles, or nuclear-reaction products, or r, so λ_{GW} >>r and also due to the slow propagation speed, all speeds <<c. Thus the quadrupole approximation is good, but still K_{I3dot} will be further refined as will the harvest

and other details of the energizing and jerk-producing or harmonic-oscillation-producing mechanism of the invention such as Δf_n and Δt. The GW produced also is "...itself the source of some additional gravitational field" as noted by Landau and Lifshitz (opcit, 1979, p. 349) and discussed in the Propulsion section of Application Serial No. 09/616,683, filed July 14, 2000. Thus attendant to the GW is a change in gravity that can be effectively utilized for the movement of mass and, hence, as a propulsion means.

100. (Amended) A gravitational wave propulsion system comprising:

a gravitational wave generator for producing coherent gravitational waves,

a housing for the gravitational wave generator for channeling and directing the gravitational waves in a direction opposed to the direction of propulsion, and

a refractive control [medial] medium for focusing the gravitational waves.

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